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CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY	USSR
SUBJECT	Geographic - Arctic Scientific - Microbiology
HOW PUBLISHED	Daily, thrice weekly newspapers; monthly, semimonthly periodical
WHERE PUBLISHED	USSR
DATE PUBLISHED	21 Aug 1954-8 Feb 1955
LANGUAGE	Russian

DATE OF INFORMATION 1954-1955

DATE DIST. 27 Apr 1955

NO. OF PAGES 18

SUPPLEMENT REPORT NO.

50X1-HUM

THIS IS UNEVALUATED INFORMATION

SOURCE As indicated

SOVIET SCIENTIFIC AND ECONOMIC ACTIVITIES IN THE ARCTIC

[All temperatures given in this report are in degrees centigrade. Numbers in parentheses refer to appended sources.]

1954 Polar Expedition

Both of the polar drift stations have covered a considerable area of the Central Arctic Basin during their more than 9 months of drift.

Severnyy Polyus 3, which was set on the ice on 9 April 1954 at 86 00 N and 175 45 W, 440 kilometers from the pole, has drifted an irregular course of 1,750 kilometers (1) and a straight-line distance of about 550 kilometers.(2) During the summer months, from June to the middle of September, this station drifted to the north (3), crossing the Lomonosov underwater range at the beginning of August and reaching a point 30 kilometers from the pole at the end of that month.(1) In early September, Severnyy Polyus 3 was located at 89 25 N and 80 00 W, and was drifting at a speed of 3 kilometers per day.(4)

With the advent of colder weather, the drift changed considerably. From 23 September to 15 October, the station's floe drifted about 90 kilometers, then slowed and began to circle near the pole. On 1 November, it was at 88 34 N and 76 41 W, having drifted to the north-northeast about 550 kilometers in the 213 days since its establishment.(3) The drift then began in a southerly direction, following a zigzag course along the Atlantic slopes of the Lomonosov range through December.(1) On 28 December, the station was at 88 11 N and 60 23 W.(2) In January 1955, wind and currents increased the drift speed, and the station covered 100 kilometers in the first 10 days of January, as compared with the average drift since April of 7 kilometers per day. In the latter part of January, the station was located at 86 35 N and 27 24 W.(1)

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Opinion on the future drift of Severnyy Polyus 3 is divided. One group of scientists believes that the station will pass through the strait between Spitsbergen and Greenland in the spring, following the course of Severnyy Polyus 1. Other scientists feel that the station will move to the east during the winter and then to the southeast -- that is, it will enter the circular, anticyclonic ice drift.(3)

The station Severnyy Polyus 4 was set on the ice 6 April 1954 at 75 48 N and 175 25 W, a point 1,100 kilometers to the south of Severnyy Polyus 3 (1) and 280 miles north of Wrangell Island.(5) During more than 9 months of drift, the station has covered a total distance of 2,200 kilometers (1) and a straight-line distance of about 540 kilometers.(2) This camp began its drift to the north-northeast, reaching 79 45 N and 177 30 E in mid-September.(3) Maximum speed of drift was recorded in September with speeds up to 12 kilometers a day (5), as compared to the 1 May-1 October average of 3.4 kilometers per day.(3)

In mid-November, the station almost reached the 81st parallel, with coordinates on 16 November of 80 58 N and 178 08 E. The direction of drift then changed sharply to the southeast, moving in this direction almost 140 kilometers to 79 43 N. In early January, the drift swung to the northeast, and in the latter part of the month, the station was located at 80 34 N and 173 32 W.

The future path of Severnyy Polyus 4 is not clear, but it appears to be following the general course taken by Severnyy Polyus 2.

If the ice floes on which the stations are located should drift out of the central polar basin, the stations will be transferred to new locations and will continue their activities.(1)

With the advent of winter, conditions at both drift stations have become more severe. In early September, temperatures of minus 10 degrees were recorded at Severnyy Polyus 3 and minus 5 degrees at Severnyy Polyus 4. The first purga of the season was felt during this period. Preparations for winter were carried out with the complete equipping of living quarters and work areas with electric lights. Ropes were strung between the central camp area and the instrument and storage areas to guide the men during purgas and periods of heavy fog. New portable houses are aboard ships now on the way to the drift stations and will be delivered there by aircraft from northern islands.(4)

At the end of December, the ice floe on which Severnyy Polyus 3 was located split into two parts as a result of pressure from the surrounding ice field. The camp has been transferred with all of its equipment to a new location. Ice motion and hummocking in the area increased in January, although the weather was clear, with little wind.(6)

The scientific program of the stations is being pursued to the fullest extent at both locations. In 9 months of drifting, the two stations have made over 2,000 meteorological observations, which were reported regularly to the mainland. The aerological section at each station has made about 550 radiosonde observations. Making good use of their helicopters, the hydrological sections have conducted research on ocean depth, currents, ocean bottom, and ice structure at the camps and over a considerable area around them. About 700 soundings were made at Severnyy Polyus 4 during the first 9 months of drift.(1) The hydrological section at the station is headed by Nikolay Dem'yanov and the aerometeorological section is headed by Leonid Ovchinnikov.(5)

Hydrological observations made at Severnyy Polyus 4 have been particularly valuable for data on water masses and on the continental slope. In the early part of the drift, soundings decreased from the starting point by more than 800 meters, then increased 2,000 meters, and again decreased 500 meters.(7)

In early January, Severnyy Polyus 3 passed over the Lomonosov range for the second time (this time on the opposite side of the pole) and recorded rapid depth increases as the station moved out over the Atlantic depression. In one day (3-4 January), the depth increased 1,450 meters. By 6 January, the depth had reached 3,855 meters, as compared with depths of from 1,300 to 1,700 meters over the Lomonosov range.(1)

Microbiological Research

Microbiological research has been of great interest at Severnyy Polyus 3. Such research has been carried on by Russian scientists in the past, but in almost all cases it was of necessity done along the shores of the mainland or the arctic islands. The organization of the two drift stations in 1954 therefore presented the first real opportunity for concerted investigations in the Central Polar Basin.

In the interest of microbiological research, A. Ye. Kriss, Doctor of Biological Science, has made two trips to the drift station Severnyy Polyus 3 -- one in July and another in September. The coordinates of the station when the first water and bottom samples were raised (on 13 July) were 88 04.3 N and 151 16 W. The depth of the ocean below the station was 3,450 meters. The station's position when the second samples were raised (on 9 September) was 89 29.5 N and 65 43 W, with ocean depth at 4,116 meters.

It is apparent, therefore, that the drift station was on the Pacific side of the Lomonosov range in July and on the Atlantic side of the range in September. Hence the findings are the more interesting.

The microbiological laboratory on the drift station was organized in the hydrological tent. Water and bottom samples were taken through a hole (about 2 meters in diameter) in the ice with the aid of a special winch developed by the Arctic Institute. For taking water samples, the bathometer of the Arctic Institute was used, and for bottom cores, the tubular system of Alekseyev (of the institute) was employed.

In July, water samples were taken from the following levels, in meters: 0 (surface at the ice), 10, 25, 50, 75, 100, 150, 200, 250, 300, 400, 500, 600, 750, 1,000 1,500, 2,000 3,000, and 3,400.

In September, samples from the 3,500- and 3,700-meter level were taken in addition to the samples from the 0-3,000-meter levels. Thus, samples were obtained for all layers from the surface to the bottom.

Before water samples were removed from the bathometer, the petcock was completely flame-sterilized. Some of the water was then poured off, and the remainder was placed in a sterile flask. Thirty milliliters of each water sample were then run through a membrane ultrafilter No 3. Each filter was placed in a Petri dish on a surface of meat peptone agar prepared in Pacific Ocean water. Because of the diffusion of nutrients from the agar through the filter, the bacteria were able to multiply and form colonies. The Petri dish with the filter was stored in a sterile metallic chest which rested on a shelf in the top of the tent and, with the aid of a gas burner, the temperature there was maintained at 25-30 degrees. After 4 days of incubation, the amount of growth was computed for each filter colony, and then they were mixed in a test tube with the same type of agar. During this operation, microscopic observations were made of the bacteria forming colonies. All of this part of the research was carried on at the drift station.

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Indoor laboratory processing of the collected materials was done in Moscow by V. I. Biryuzova, A. S. Tikhonenko, and V. A. Lambina of the Division of Marine Microbiology, Institute of Microbiology, Academy of Sciences USSR.

Table 1 (appended) gives the data on the number of bacteria colonies grown from water samples taken in the North Pole area, as well as the composition of these colonies.

It is apparent from the table that heterotrophic bacteria are found at almost all depths of the Polar Basin in the area of the North Pole. In certain layers no bacteria were found (at 750 meters in September and at 3,400 meter in July); however, this in no way indicates sterility of these water levels but rather a low incidence of bacteria, as shown by research in the Pacific Ocean. During filtration of sufficiently large amounts of water, heterotrophic bacteria are found at all ocean depths.

The number of heterotrophic bacteria per liter of water ranged from 35 to several thousand. In vertical distribution, the heterotrophes were found in both small and large localization. The greatest number of colonies grew from upper-layer water samples (from the surface to a depth of several hundred meters). It is characteristic that the July and September water samples taken from the same ocean levels differed as to the volume of bacteria. In July, when life is at its peak even in the Central Arctic, the filter surface from the 0-meter level was covered by bacteria using assimilable organic materials for nourishment.

In the microbiological laboratory on the drift station, water samples taken from almost all ocean levels from the surface to the bottom were placed in sterile flasks (250 milliliters) which were then sealed with glass stoppers and stored for about a week at temperatures of 5-7 degrees and later at temperatures of 18-22 degrees (in Moscow). It is known that in sea water taken from various depths and placed in stoppered flasks, the number of heterotrophic bacteria will increase many times -- from ten to a million times. Since no nourishment is added to the flask during the incubation period, it is apparent that the multiplication of the bacteria results from organic material already present in the water. Under natural conditions, these materials are for the most part stable and poorly assimilable, such as so-called "water humus." Therefore, in the open sea, even at surface layers, the incidence of these heterotrophes is insignificant as compared with the numbers grown in the laboratory culture. In sea water placed in a flask, these materials are transformed into a material which is assimilable by the microorganisms. It was interesting to note the capacity of organic materials from ocean depths of the polar area to change to assimilable materials for heterotrophic microorganisms. After 2-4 months of storage, the number of heterotrophes increased 10 to 10,000 times in flasks containing water taken not only from the surface but also from depths of 1,000, 1,500, 2,000, 2,500, 3,000, and more meters.

In water taken from the 1,000-meter level, for example, 175 heterotrophic bacteria were found per liter of water. After 2 months in a sterile container, there were over 2,600,000 bacteria present. In a flask containing water taken from the 2,000-meter level, the number of bacteria increased during the same period of time from 210 to 11,300,000, and in a flask containing water from the 3,500-meter level, the increase was from 350 to 5,000,000 bacteria.

Bacteria which were grown in artificial albumin cultures after separation from water samples of different levels were largely bacilli in form. Among them, short and long, thin and thick, homogeneous and granular, mobile and immobile bacilli were observed. The majority did not form spores, but sporogenous bacteria were encountered at various depths. Cocci were found only in a few ocean layers.

The presence of yeast organisms in the water samples was also of interest. Colonies of white and rose yeasts were grown from water samples taken from depths of 0, 10, 25, 100, and 250 meters and from bottom silt taken from a depth of 3,450 meters. The discovery of yeasts in the area of the North Pole affirms that they, like bacteria, have no northern boundary.

To establish the over-all number and composition of microbes in the area of the North Pole, direct microscopic observations were made. In the microbiological laboratory at the drift station, 15 milliliters of each water sample were filtered through a membrane filter prepared according to the method of Ye. A. Rukinov and V. I. Biryuzova. The filter with the microorganisms on its surface was first placed in formalin vapor to fix the microbe cells, then colored with one-percent erythrosine and 5-percent carbolic acid for 24 hours, and finally cleared with cedar oil. Observations were made under a microscope with immersed objective at high magnification. In 100 visual fields, i.e., 10,000 square optic grids, the number of microbe cells was computed and their morphological varieties determined. Knowing the area of the filter and the amount of filtered water, it is possible (by existing formulae) to determine the quantitative incidence of microorganisms in one liter of water from a given sample.

Table 2 (appended) gives the data on the general quantity of microorganisms per liter of water for all ocean levels in the area of the North Pole. The table also includes data from a number of stations in the northwest Pacific Ocean for comparison purposes. As is apparent from the table, direct microscopic inspection of microbe cells on filter membranes gives a more complete estimate of the number of microbes present in various layers of the Arctic Ocean than does the culture method. For example, at depths up to 150-250 meters from the surface, the microorganisms per liter number in the thousands. Tens of thousands were found even at the surface in the ice hole.

As increase in the incidence of microorganisms was noted at depths of 100-150 meters in July and at depths of 50-100 meters in September. The concentration was, however, considerably less than at 82 00 N, as recorded by V. S. Butkevich.

It appears that hydrological phenomena cause irregular microbe distribution in the area around the North Pole. It follows that study of the vertical and horizontal distribution of microorganisms in the Arctic Ocean can give valuable data on the hydrology of the Polar Basin.

In water layers from 200 or 300 up to 2,000 meters, microorganisms are counted in the hundreds, while in greater depths they are counted by tens.

Differences between the Arctic and Pacific Oceans with respect to the density of microorganisms, as indicated by the table, have evinced a great deal of interest.

In the area of the North Pole, biological concentration of microbe cells in the upper water layers is expressed in milligrams per cubic meter of water, but as depth increases, it is expressed in tenths and then hundredths of milligrams, and at great depths, it reaches thousandths of milligrams per cubic meter of water (Table 3, appended).

(Note: Source gives formulae for computing biological concentration.)

These observations on vertical distribution of biological concentration were made on bacilli and cocci bacteria of the usual type. But in addition to these usual types, coccus-like bacteria with thickened membranes were also found in layers of the ocean from the surface to the bottom. In deep portions of the Sea of Okhotsk and adjacent areas of the Pacific Ocean, the latter forms were discovered earlier (A. Ye. Kriss and Ye. A. Rukina), but, as opposed to bacteria of the usual types, they were either rarely observed at the surface or, in any case, observed in small numbers. The largest concentrations were found in deep water layers and significant numbers were even found in bottom sediment. Near the North Pole, these coccus-like bacteria with thickened membranes were uniformly found throughout the vertical layers of the ocean, although the concentration was greater on the Pacific side of the Lomonosov range than on the Atlantic side. The average number of these forms was half the number of usual forms.

Direct microscopic observation has indicated that the greatest variety of microbe forms occurs at the surface water layers (Figure 1, appended). In these layers, cells were found of many types -- round or oval in shape, small or large, single or in small accumulations. Bacilli of various shapes and sizes and with different plasms were also encountered.

It should be noted that in July, the qualitative composition of the surface layers was richer than in September. Thus, the Arctic summer was richer not only in quantity of microorganisms but also in morphological variety in the upper water levels.

The characteristic of the composition of microbes living in the ocean near the North Pole is the presence of large vacuoles in cells at all layers, from the surface to the bottom and on both sides of the Lomonosov range. Often these vacuoles occurred in clusters or chains. Microbe cells of the colony type were discovered mostly in the upper ocean levels. In the majority of cases, these colonies were made up of fewer than 10 cells, but colonies were found of 10, 20, and more cells.

As indicated earlier, the microbiological work done at Severnyy Polyus 3 in July and September of 1954 included work on bottom samples in addition to water samples. The surface layers of silt (from 0-2 centimeters) were removed with great care and placed in a sterile test tube. A preweighed quantity was then placed in sterile water in a series of mixtures increasing in concentration in multiples of ten. From .1 to .5 milliliters of each mixture were then placed on meat peptone agar prepared in Pacific water, and one milliliter was placed in meat peptone bouillon, in Gil'tay's culture for denitrifying microorganisms, in Vinogradskiy's culture and phosphorous-ammonia-magnesium salts culture for nitrifying microorganisms, in Tauson's culture for desulfurizing microorganisms, and in Natanson's and Beyyerink's culture for thio-oxidizing microorganisms.

(Note: Source gives the chemical composition of these cultures.)

In addition, preweighed silt samples were prepared in suspensions of 1:10, 1:100, and 1:200 in .0004N NaOH for direct microscopic study.

In the meat peptone agar, several colonies grew which contained hundreds of heterotrophic microorganisms per liter of water. The colonies contained sporogenous and non-sporogenous cocci, bacilli, and yeast. In the meat peptone bouillon, growth was observed only in the first suspension of 1:20 for the July samples and 1:70 for the September samples. Similar results were obtained in the Gil'tay culture, although no nitrates were observed. Discernible denitrifying with nitrate formation took place in the Beyyerink culture with a 1:200 suspension for July samples and a 1:70 suspension for the September samples.

Nitrates appeared in the culture of phosphorous-ammonia-magnesium salts in the first mixture, as was the case in Vinogradskiy's culture. These same mixtures formed sulfates in the Natanson and Beyyerink cultures. It should be noted that observation on growth from all samples and for all classes of microorganisms was carried out over the course of 3-5 months.

During direct microscopic observation of bottom silt (magnified by computation for content per gram of natural silt) from 4 [million?] to 304 million microbe cells of the usual type were counted in addition to 170-400 million coccus-like forms with thickened membranes.

These microbiological investigations coupled with increased future activity should certainly be of the utmost interest in the study of the Central Arctic Basin.

Visits to Drift Stations by Soviet Scientists

To organize and initiate the work of the Institute of Oceanography (Academy of Sciences USSR) in the 1954 polar expedition, in July 1954, V. G. Kort, director of the Institute, and L. A. Zenkevich, chief of the benthos laboratory, visited the drift stations of the Main Administration of the Northern Sea Route.

In addition to the two drift stations, they visited the marine observatories at Pevek and Dikson and the Polar station "Mys Chelyuskina" to become acquainted with the character of the ice distribution in the Arctic Basin and to study the possibility of stationing observers on the drift camps for the purpose of making precise studies of geologic, hydrobiological, and oceanographic questions.

A study of the program of the drift stations indicated that they were carrying on a broad program in geophysics and oceanography, but that this program could be greatly expanded if the stations received the necessary methodological and technical help. It was determined that one of the most important facets of the observation was the drift of the stations and it was decided to record this more precisely.

The Institute of Oceanography had many recommendations at its disposal on the outstanding questions, and discussions were carried out, especially with the heads of the stations, on the use of new methods for research as developed by the institute.

To determine speed and direction of drift more precisely, the institute introduced new electromagnetic equipment. N. N. Sysoyev was sent to the station Severnyy Polyus 3 in September to begin operation of this equipment.

During a visit to Severnyy Polyus 3, L. A. Zenkevich took samples of mucilaginous masses of microscopic algae which floated on the surface among the ice in discernible clusters.

In circumpolar probes, Professor P. I. Usachev found massive quantities of two types of diatoms: Melosira arctica and Chaetoceras septentrionalis. Other benthos diatoms were found among these masses. (13)

In addition to the research activities already being pursued by the 1954 expedition, several new activities have been assigned. These include observations on gravity distribution, large core samples of the ocean bottom, and more precise studies of ocean fauna and bird flight-routes. New equipment will be necessary to carry out these tasks. Some of these instruments are being produced by the Geophysical Institute of the Academy of Sciences USSR, and others are being developed by the Institute of Oceanography. (8)

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Air communication with the drift stations is being maintained from the mainland in spite of severe weather and the polar night. In October, the Polar Aviation aircraft SSSR-N-475 (I. P. Mazuruk, commander; M. Kaminskiy, co-pilot; V. Chechin and G. Kosukhin, flight engineers; A. Chelyshev, radio operator; S. Makarov, navigator.) left Moscow on its ninth trip to the polar region with supplies for the station.(9)

In September, the stations were visited by another group of scientists from the Academy of Sciences USSR and the Moscow State University imeni Lomonosov. Among them were Professor Dobrovol'skiy, Sysoyev, Doctor of Technical Science, and Gusev, Doctor of Physical Mathematics.(10)

One of the most extensive series of flights to the polar region was made shortly after the drift stations were established. This was made by D. I. Shcherbakov, who, in his capacity as chairman of the Division of Geology and Geography of the Academy of Sciences USSR, was serving as a consultant to the expedition. Shcherbakov left Moscow by passenger aircraft at the end of April and crossed the Pay-Khoy Khrebet (mountains) to a landing strip [Apparently the strip at Amderma]. At this point, he transferred to an aircraft piloted by I. P. Mazuruk and navigated by D. N. Morozov. N. A. Volkov, hydrologist, was also aboard as an observer. This aircraft continued to the second stop and landed on bay ice at an island base. [Comment: Assuming that the aircraft was following the regular flight route in this area, the second stop would be Ostrov Dikson.]

From the airstrip, the group transferred to the town composed of several dozen two-story, log houses situated on a craggy diabase spur. The port and power station of this polar settlement, which could be seen from the pilot's quarters, was a busy place, with constant arrival and departure of aircraft crews from the airstrip.

The following morning, Shcherbakov was briefed by V. F. Burkhanov on the situation of the 1954 expedition and results which had been obtained from their research up to that time.

There were three methods of research being employed in the Arctic at that time. The first was the establishment of drift stations on ice floes whose rate and direction of drift was predetermined to carry the stations into desired areas. The second method was developed by I. I. Cherevichnyy in 1941 and consists of numerous landings on the ice by aircraft for short periods of time while observations are made. The third method is the nonstop flight from a shore point to the pole and back without landing; in this case, observations on ice and weather are made from the air. The 1954 components employing the first two of these methods were to be visited by Shcherbakov.

On 29 April, plans were completed for the flight to the intermediate base of I. I. Cherevichnyy on the Franz Joseph Archipelago, and the aircraft carrying Shcherbakov took off at 1045 hours on that date.

The aircraft proceeded over Mys (cape) Zhelaniya at the tip of Novaya Zemlya and Ostrov Sal'm in Franz Joseph Land to Mys Granta on Zemlya Georga, where the base was located. Although fueling was begun for immediate take-off, worsening weather conditions postponed the flight to Cherevichnyy's forward camp until the next morning. The temperature at Mys Granta was 18 degrees below zero.

At 0330 hours Moscow time on the next day, the aircraft took off for the forward camp, crossing the 89th parallel at 0750 hours. After about 40 minutes, the aircraft landed at the advance base, where the group was met by Cherevichnyy and his companions Ye. K. Fedorov, Ya. Ya. Gakkel', and M. Ye. Ostrekin. The oblong floe on which the camp was situated was covered with snow and hemmed in by hummocks 2-3 meters high. Air temperature was 19 degrees below zero.

After a survey of the program being carried on by Cherevichnyy's mobile group and consultations on future work, the aircraft bearing Shcherbakov flew on to the drift station Severnyy Polyus 3.

Landing on the ice a few kilometers from the station, the group was transferred to Severnyy Polyus 3 by a helicopter which had been put into service in this area after flying from Moscow under its own power -- a distance of 8,000 kilometers.

The floe on which the station is located, larger than the one in use by Cherevichnyy, had been split by a fissure but was reunited by pressure before the arrival of Shcherbakov.

After consultations with A. F. Treshnikov, Shcherbakov took off for Severnyy Polyus 4, which was located at a distance of 1,200 kilometers in the direction of the mainland.

The aircraft remained in this camp long enough for the usual consultations and then took off for Mys Shmidta.

After several hours' flight, the mountains of Wrangel Island were reached, and another hour's flight brought the aircraft over a large polar settlement situated on a cape jutting out from the shoreline.

Reaching the mainland, the aircraft turned to the west, flying along the shore of the Asiatic Continent and making numerous stops at points from which food, equipment, and fuel were being shipped to the drift stations. The aircraft flew over the Chaunskaya Guba (bay), with the adjacent village of Pevek, and on to the west over the Kolyma River and the settlement of Kresty on its banks. For purposes of ice survey, the aircraft flew over Proliv (strait) Sannikova and the shores of the Ostrova Lyakhovskiye before landing on the ice at Tiksi. It was noted that at Tiksi, as at most of the settlements the aircraft visited, fuel for power and other needs was obtained from nearby diggings.

After a short stop at Tiksi, the aircraft again took off for a survey flight of the polar area. With stops at the northernmost point of Siberia and Severnyy Polyus 3, the aircraft proceeded to the auxiliary base of the Cherevichnyy group on the other side of the pole. En route, observations were made of ice conditions, with the aircraft often flying at an altitude of 500 meters. At 1600 hours Moscow time, the group landed at the auxiliary camp headed by M. N. Kaminskiy. After a short stop, during which the group discussed the ice islands and the possession of one of them by the US Air Force, the aircraft continued on its survey flight. This flight was of 5 hours' duration, at the end of which the group landed at Kaminskiy's camp once more.

At 0945 hours on 6 May, the return trip to the mainland began. This time the course lay over Ostrov Vize, and the mainland was reached at 1800 hours Moscow time -- a return trip of only 8 hours.

Thus, in 8 days, the aircraft carrying Shcherbakov had flown over the circumpolar area twice, visited the North Pole and other polar regions, and covered a total distance of 16,500 kilometers.(11)

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The components of the expedition not visited by Shcherbakov -- the "flying observatories" making nonstop flights to the pole and back -- have done a great deal of work on weather and ice conditions. These flights are directed by I. M. Dolgin, Candidate of Geographic Science, and his associates P. A. Gordiyenko and N. A. Volkov.(8)

The subject of scientific stations drifting on the ice is covered quite thoroughly in a new film which has been released in the USSR, "376 Days on Drifting Ice". The film is a documentary on the drift of Severnyy Polyus 1 in 1937, Severnyy Polyus 2 in 1950, and Severnyy Polyus 3 and Severnyy Polyus 4 in 1954.(12)

[Illustrations include: the meteorological section at drift station Severnyy Polyus 3 (CIA Photo Accession No 151326), aerologists prepare to make atmospheric observations at Severnyy Polyus 3 (151328), A. D. Malkov making observations of solar radiation at Severnyy Polyus 3 (151327).]

Soviet Activities at Continental and Island Settlements

In spite of the polar night and purgas which engulf Bukhta Tiksi, caravans of bulldozers, tractors with sledges, and trucks continue to move across the bay ice to the coal mines in order to maintain shipment of coal. This transport has already completed 50 trips above the plan.

In the port, marine-engine repairs are being carried out with lathe operators, blacksmiths, forgers, and foundry hands working at full capacity.

Air traffic at the Tiksi airfield is very heavy with flights from Moscow and other points on the continent as well as supply flights to the drift stations in the Central Polar Basin.

P. Kardashev, editor of the newspaper Sovetskaya Arktika, reports that hundreds of polar workers in Tiksi are studying in night schools to increase their qualifications.(14)

The city of Igarka celebrated its 25th anniversary in 1954. The first settlers arrived in the area on 20 July 1929 and the very next year were receiving ocean-going vessels for shipping timber.

The city now has about 30 streets, two-story houses with central heating, schools, museums, clubs, a hospital, and many stores as well as telephone, radio, and autobus facilities. The pride of the city is the great timber combine located there. A fish-processing plant and ship repair shops are also in operation, and a grain plant is being built.

Igarka has always been a wooden city -- the houses, sidewalks, and bridges are all of wood construction. Now, however, the construction of a brick plant is under way, and the first stone building in the town is being built.

A secondary medical school for training personnel for the far north opened in 1954.(15)

Petr Moskalenko, pilot for Polar Aviation, recently established a new island polar station. Moskalenko had just returned from the polar area where he had taken part in the establishment of Severnyy Polyus 3, when he received word from the chief of Glavsevmorput' (Main Administration of the Northern Sea Route) to proceed to Severnaya Zemlya to pick up three men and their equipment for transport to an island where a new meteorological station was to be set up.

The island on which the station was to be established rises as a diabase hump in the most capricious part of the Arctic Ocean. It is washed on one side by the warm waters of the Gulf Stream and on the other side by the cold water of the Arctic Ocean. Its location makes it very important for the forecasting of weather on the Northern Sea Route. Attempts were made in the past to establish automatic meteorological stations there, but each time the stations were destroyed by polar bears.

When the aircraft arrived at Severnaya Zemlya, 15 tons of supplies, tents, and houses for the future station were loaded on the plane. The aircraft crew then settled down with the men who were assigned to the station -- Yevgeniy Vetrov, chief; Ivan Isayev, radio operator; and Anatoliy Artem'yev, meteorologist -- to wait for suitable flying weather.

With the clearing of the weather, the group took off and headed for its destination. After an hour and a half of flying, when still 300 kilometers from the island, the fog which was expected at their destination was first encountered.

A landing was finally effected on the island in spite of the fog which enclosed it and the 150-meter-high glacier which made landing hazardous. After 4 hours on the island, where no one had ever lived before, a portable arctic tent had been set up, the radio antenna raised, and the psychrometer enclosure placed on its foundation.

On a second run to the island, the aircraft was to deliver portable wooden houses, extra provisions, and another radio station to the members of the station.(16)

Construction is being expanded in the Arctic areas of the Soviet Union. Glavsevmorput' has been active in the building of both housing and civil construction, and he is now working on the problem of using building-types which save on materials, all of which must be brought into the Arctic. Giproarktikproyekt (State Institute of Arctic Installation Planning) is particularly active in work to adapt buildings for arctic conditions.(17)

An intensified effort is also being made to bring electricity and radio to the kolkhozes in the Taymyr National Okrug. Half of the kolkhozes in Avamskiy Rayon have been electrified and all have radio facilities.(18)

The use of helicopters for hunting by the personnel of polar stations has been reported. When not in use, the helicopters are covered and readied for use with preheaters. Courses when under way are plotted by astrocompass.(19) [Comment: This instrument is apparently similar to the solar compass as developed by the National Geographic Society and used by Admiral Byrd in the Antarctic.]

[CIA Photo Accession No 151325 shows the polar settlement of Olenek.]

Table 1. Growth in Albumin Cultures of Heterotrophic Microorganisms From Waters of the Arctic Ocean in the Area of the North Pole

Depth (meters)	July 1954 No of Colonies (per liter of water)	July 1954 Morphological Composition	September 1954 No of Colonies (per liter of water)	September 1954 Morphological Composition
0	Continuous growth	Bacilli	525	Sporogenous and nonsporogenous bacilli, cocci, yeast
10	1,120	Nonsporogenous bacilli, yeast	1,995	Nonsporogenous bacilli
25	35	Yeast	2,485	Sporogenous bacilli
50	315	Sporogenous bacilli	350	Sporogenous and nonsporogenous bacilli
75	490	Nonsporogenous bacilli	735	Sporogenous bacilli
100	2,660	Nonsporogenous bacilli, yeast	140	Sporogenous bacilli
150	210	Nonsporogenous bacilli	2,660	Nonsporogenous bacilli
200	35	Nonsporogenous bacilli, cocci	3,045	Nonsporogenous bacilli
250	455	Nonsporogenous bacilli, yeast	665	Nonsporogenous bacilli
300	Mucilaginous growth	Sporogenous bacilli	980	Nonsporogenous bacilli
400	280	Nonsporogenous bacilli	105	Sporogenous bacilli
500	455	Nonsporogenous bacilli	245	Sporogenous bacilli
600	490	Nonsporogenous bacilli		
750	70	Nonsporogenous bacilli	0	
1000	420	Sporogenous bacilli	175	Nonsporogenous bacilli

Depth (meters)	July 1954: No of Colonies (per liter of water)	July 1954: Morphological Composition	September 1954: No of Colonies (per liter of water)	September 1954: Morphological Composition
1500	70	Nonsporogenous bacilli	105	Nonsporogenous bacilli
2000	175	Sporogenous bacilli	210	Sporogenous and nonsporogenous bacilli
2500	280	Nonsporogenous bacilli	245	Nonsporogenous bacilli
3000	210	Nonsporogenous bacilli	35	Sporogenous bacilli
3400	0	--		--
3500	--	--	350	Sporogenous bacilli
3700	--	--	140	Nonsporogenous bacilli

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[Adjoins page 15 here.]

Table 2. Quantity of Microbe Cells (in One Liter of Water) at Various Depths of the Arctic Ocean Near the North Pole and in the Northwestern Part of the Pacific Ocean.

Depth (meters)	Arctic Ocean, North Pole Area		Pacific Ocean (Northwest) May-July 1953			
	Jul 54	Sep 54	Sta 1	Sta 2	Sta 3	Sta 4
0	39,379	5,229	57,239		86,788	140,673
10	7,934	8,596	41,580		94,893	35,042
25		8,935	34,554		116,597	13,007
50	2,645	12.084	16,828		82,686	7,267
75	2,636	8,735	14,261		29,776	8,346
100	6,177	4,367	12,142		21,482	1,742
150	4,428	1,418	15;216		11,797	2,184
200	1,879	679	6,318		8,515	7,157
250	1,966	305	2,463		10,699	1,651
300	722	218	2,931		2,294	1,086
400	574	305			507	410
500	757	209	2,080		240	1,183
600	99		1,605		234	780
750	228	174	2,405	18,421	143	637
1,000	853	818	1,735	6,981	117	306
1,500	235	635	1,514	14,690	507	468
2,000	252	479	962	435	201	176
2,500	96	87	1,150	299	91	111
3,000	52	44	760	331	46	59
3,400	35					
3,500		44				
4,000			572	208	39	
5,000				91	20	
6,000					26	
7,000					33	
8,000				97		
8,500						
9,000						

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Pacific Ocean (Northwest) May-July 1953

Sta 5	Sta 6	Sta 9	Sta 14	Sta 17	Sta 22	Sta 26
	96,200	233,669	406,146	165,347	165,321	95,413
	87,308	149,708	375,915	171,802	216,599	380,263
	176,300	113,997	278,272	91,982	21,261	245,973
	60,294	72,111	192,212	42,510	17,979	113,646
	55,718	57,647	175,377	46,332	15,944	134,654
	25,649	19,162	112,379	39,520	13,721	95,914
	3,283	15,633	46,371	14,372	22,867	81,881
	2,821	16,218	18,044	6,396	15,158	72,228
	1,417	9,438	8,262	1,690	2,151	63,700
	1,671	8,067	6,624	3,757	2,392	20,930
	1,339	5,408	4,758	1,164	663	4,849
	1,274	4,154	3,666	793	448	2,750
	709	2,152	1,177	468	494	2,152
	624	2,260	1,209	247	162	1,138
1,651		1,684	1,333	728	266	767
		3,075	169	559	182	702
943		1,268	182	423	104	397
813		1,205	111	156	208	195
494		}429	65	266	247	163
494		176	46	156	117	39
397				110		39
						91
						98
						65
						33
						33

Table 3. Average Biologic Concentration of Microorganisms of the Usual Type and of the Coccus-Like Type, With Thickened Membranes, At Various Depths of the Arctic Ocean Near the North Pole (mg per cu m of water)

Water layer, (meters)	Microorganisms of the Usual Type		Coccus-Like Forms With Thickened Membranes	
	Jul 54	Sep 54	Jul 54	Sep 54
0-10	4.74	1.38	0.12	0.12
10-25	--	1.7	--	0.06
25-50	--	2.1	--	0.05
10-50	1.06	--	0.12	--
50-75	0.52	2.08	0.14	0.03
75-100	0.8	1.3	0.17	0.03
100-150	1.06	0.58	0.17	0.07
150-200	0.6	0.2	0.1	0.1
200-250	0.38	0.1	0.09	0.08
250-300	0.2	0.05	0.12	0.06
300-400	0.13	0.05	0.08	0.06
400-500	0.134	0.05	0.04	0.06
500-600	0.086	--	0.11	--
500-750	--	0.03	--	0.6
600-750	0.03	--	0.16	--
750-1,000	0.1	0.09	0.13	0.05
1,000-1,500	0.1	0.14	0.13	0.03
1,500-2,000	0.04	0.1	0.11	0.05
2,000-2,500	0.03	0.05	0.1	0.06
2,500-3,000	0.014	0.01	0.2	0.02
3,000-3,400	0.007	--	0.13	--
3,400-3,700	0.005	--	0.04	--
3,000-3,500	--	0.008	--	0.02

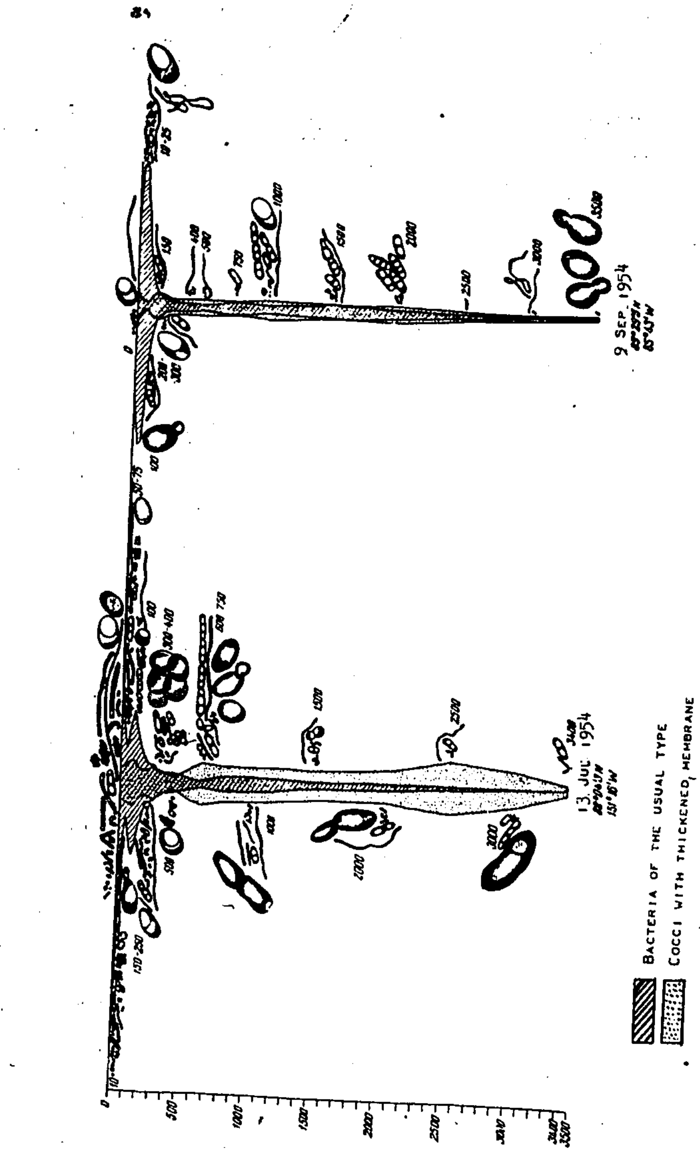

Figure 1. Vertical Numerical Distribution, Biologic Concentration, and Morphology of Microorganisms at Various Depths of the Ocean Near the North Pole.

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